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ABSTRACT

The study, involving two severely retarded adolescents, investigated whether matching to sample is capable of extending equivalence classes with spelling responses. In preliminary training, Ss were taught the matching to sample procedure by having them match color patch samples to identical color patch comparisons. The experimenters then trained the spelling procedure by teaching Ss to move appropriate letters when printed letter samples appeared on a spelling card. After preliminary training, the test battery was administered with tokens given for correct responses. Both Ss were able to match color patches to the dictated words and to orally name color patches. All other performances were either nonexistent or at very low levels. Posttests showed that Ss could treat whole printed words as members of the equivalence classes. Findings suggested that procedures are available to train the severely handicapped in simple academic tasks. Diagrams, charts, and illustrations of experimental materials are provided. (SB)

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Teaching Spelling via Stimulus Equivalences

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Research with human subjects has shown that matching-to-sample procedures are capable of establishing stimulus equivalences without direct training, although the stimuli bear no physical resemblance to each other. Data have suggested that the concept of stimulus equivalences may provide an explanatory mechanism for generative behavior processes that are not accountable in terms of stimulus generalization.

The relevancy of the matching paradigm to the production of new behavior stems from the work of Sidman and others. The first slide (SLIDE 1 - TRANSFER TRIANGLE) illustrates one experiment (Sidman and Cresson, 1973). Severely retarded subjects learned to match 20 dictated words to pictures, and to name the pictures orally. These subjects were also taught to match the same set of dictated words to corresponding printed words. After this crossmodal training, subjects could then perform the purely visual tasks of matching the pictures with the printed words without additional training. Oral naming of printed words also emerged in the absence of direct teaching. Similar results have been obtained with less retarded subjects (Sidman, 1971), global aphasics (Glass, Gazzaniga, and Premack, 1973), and normal preschool children (Lazar and Kotlarchyk, submitted; Sidman and Tailby, submitted). (End Slide 1)

It has been suggested that the emergence of new behavior occurs with matching to sample because classes of functionally equivalent stimuli are established between samples and corresponding correct comparison stimuli. If two comparisons become equivalent to the same sample, they can become equivalent to each other. For example, the interchangeability of the printed word cat and the picture of a cat with the dictated word "cat" indicates that an equivalence class has formed.

In the standard matching procedure, subjects indicate their choice by a

single pointing response. Suppose that instead of training the subject to point to the printed word, we now required a more complex matching response, such as selecting letters from a large pool and arranging them in the appropriate order, i.e. spelling. Is matching capable of establishing crossmodal equivalences with this form of spelling in retarded subjects?

The next slide (SLIDE 2 - PARADIGM) illustrates the addition of this new spelling procedure. The four bottom boxes are similar to those shown in the first slide, except now the stimuli are six colors and their names. Arrows point from samples to comparisons. The critical modification is the addition of written color naming, i.e. our spelling procedure. We were interested in exploring the following possibilities: Does the production of the written color name resemble matching with the whole printed word? If so, then any equivalence involving the spelled word should also include the whole printed name. For example, a subject who has previously learned to match color patches to dictated words is then taught to spell words to the same dictated word samples. Would he now be able to match the <u>whole</u> printed word to the dictated word, and to match the <u>whole</u> printed word with the appropriate color patch, without additional training? A class comprised of the dictated name "red", the color patch red, and the written color name should also include the printed work <u>red</u>, verified by the subject's emergent ability to match the whole printed word to the dictated word and to the color patch. Similarly, if a second subject could already match color patches to the dictated words, and we taught him to spell in response to color patches, then there should now be an equivalence of the whole printed words with the color patches and with the dictated word samples. Including the assessment of oral naming of color patches and printed words, there were eight performances under consideration.

The subjects were two severely retarded, teenage boys who participated in an ongoing behavior modification project.

Six colors and color words were used: red, green, blue, black, yellow, and orange. For materials presented visually, patches of colored paper and Xerox copies of printed words were affixed to display cards as samples and comparisons. Dictated words were presented by a cassette recorder.

In standard matching-to-sample tests, display cards were divided into 12 segments in three columns and four rows. The next slide (SLIDE 3 - COLOR PATCH SAMPLE) shows that visual matching trials began with the presentation of a sample stimulus in the upper left segment: the choices were covered. When the subject touched the sample, (SLIDE 4 - PATCH/WORD) the cover card was removed to expose the comparison stimuli. The subject touched one comparison stimulus to indicate his selection. Correct choices were rewarded with a token: no token followed incorrect choices. After each choice, the cover card was replaced, and several seconds later the next trial began. Whereas this slide shows a color-patch sample with printed word choices, the next slide (SLIDE 5 - WORD/PATCH) illustrates a printed word sample with color patch choices.

As the following slide (SLIDE 6 - AUDITORY SAMPLE) shows, trials with auditory samples began with a blank segment in the upper left of the display card; the dictated word was repeated every 1-2 seconds. When the subject touched the blank segment (SLIDE 7 - AUDITORY/WORD), visual comparisons appeared. To make the choice period comparable to that for visual samples, the auditory stimulus continued to be presented until the choice was made.

For oral naming tests, subjects were presented the printed word or color patch and asked, "What is this?" No pointing response was required.

The remaining two tests were the written naming tasks. The next slide

(SLIDE 8 - PATCH/ANAGRAM) shows a trial in which the subject had to spell in response to the color patch sample. They were required to pick the appropriate moveable letters from the pool and to place them on the line in the correct order, going from left to right. The trial ended either when the word was spelled correctly or when a letter was placed inappropriately. The next slide (SLIDE 9 - AUDITORY/ANAGRAM) shows a spelling trial in which the sample was auditory. In this instance, the dictated word was repeated until the trial was over. The line on which letters were placed in all spelling tasks was always the same length, regardless of the number of letters in a color word.

Each of the eight tests consisted of 18 trials so that each of the six color stimuli could appear three times as samples. The position of comparison stimuli in the standard matching tests changed across trials. The position of the moveable letters in the spelling tasks was also varied from trial to trial.

In preliminary training, the retarded subjects were taught the matching-to-sample procedure by having them match color patch samples to identical color patch comparisons. We then trained the spelling procedure by teaching subjects to move appropriate letters when printed letter samples appeared on a spelling card. The next slide (SLIDE 10 - ANAGRAM TRAINING) illustrates how we ensured that each subject learned appropriate letter sequencing before we proceeded with the experiment.

After preliminary training, the entire test battery was administered as a pretest. Subjects were given tokens for correct responses, but received no tokens for errors. The next slide (SLIDE 11 - PRETEST) shows the results of the pretest. Each row represents a different test. The left column shows the sample stimuli; the next column lists the comparison stimuli or

responses.

The results for each of the two subjects, whom we have called A and B, are shown in the column under the corresponding letter. We found that both subjects were able to match color patches to the dictated words and to orally name color patches. All other performances were either nonexistent or at very low levels. When we look at our schematic in the next slide (SLIDE 12 - PARADIGM) we can evaluate the strong performances in the context of the total battery.

The critical training for Subject A was written color naming in response to the color patch; for Subject B it was written color naming in response to the dictated word. The next slide (SLIDE 13 - ANAGRAM FADING) shows how we used a fading procedure to teach Subject A written color naming in the presence of the red color patch. On the initial step, all the letters in the color name appeared with a line under each letter. Then, in succeeding steps, letters on the lines were systematically eliminated. The last letter in the word was removed first, then the last two letters, until all the letters had been removed and only the lines remained. The subject's task was to match the moveable letters present in each step and to fill in any missing letters. The short lines were then connected to produce a single line. In the last step, the line was extended to conform to the standard length and the number of letters in the pool was increased to encompass all the possible letters used to spell color words. A similar program was used to teach Subject A to spell all six words in the presence of the color patch. For Subject B, the sample was the dictated word, instead of the color patch, but the same fading procedure was used to teach spelling.

(SLIDE 14 - PARADIGM) We could now answer our experimental questions. If subject A could match color patches to dictated words, as shown in the

pretests, and he could spell words in response to the same color patches, would he be able to match whole printed words to dictated words and to color patches without further training? Similarly, if Subject B could match color patches to dictated words, as demonstrated in the pretests, and he was able to spell in response to the same dictated words, would he be able to match whole printed words to dictated words and to the color patches without training? If such equivalences formed for both subjects, would they be able to orally name the printed word? All this assessed by readministering the entire test battery as a posttest.

The results are presented in the last slide (SLIDE 15 - POSTTEST). Both subjects were able to learn the corresponding spelling tasks prior to the posttest. The posttest data show that having been taught one additional task, the full set of equivalences emerged without additional instruction.

These data extend the earlier findings of Sidman and others by demonstrating that matching to sample is capable of extending equivalence classes with spelling responses. The pretests showed that each subject could match color patches to dictated words and orally name the color patches. Subject A learned to spell color names when presented with color samples, and Subject B learned to spell given dictated color words. The posttest then showed that each subject could treat whole printed words as members of the equivalence classes. At a practical level, the outcomes of this experiment suggest that procedures are available to train severely handicapped people in simple academic skills.

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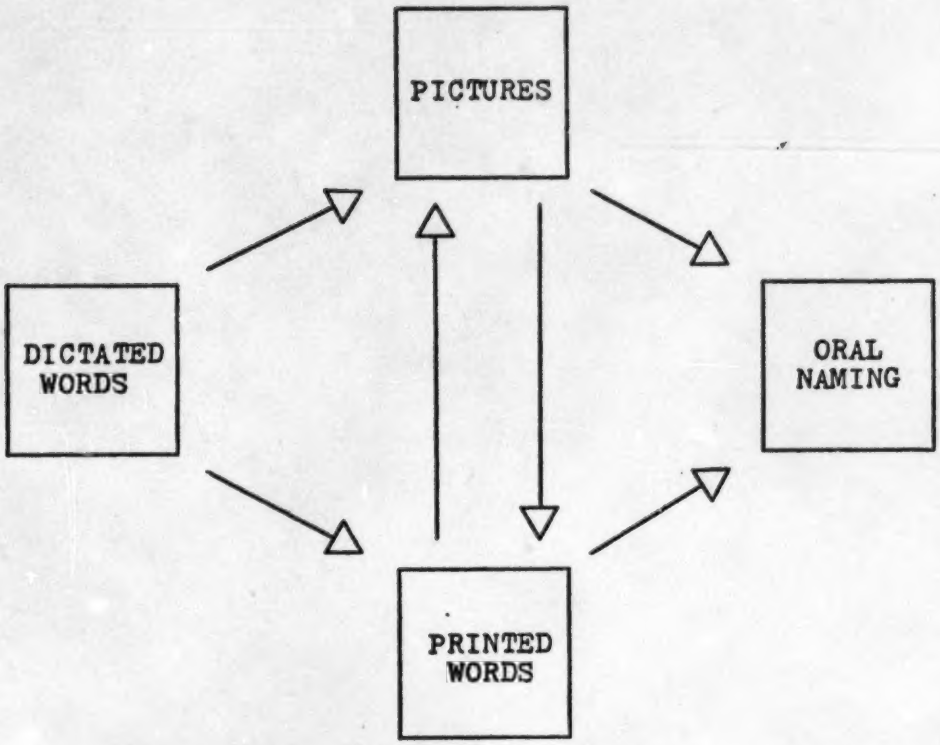
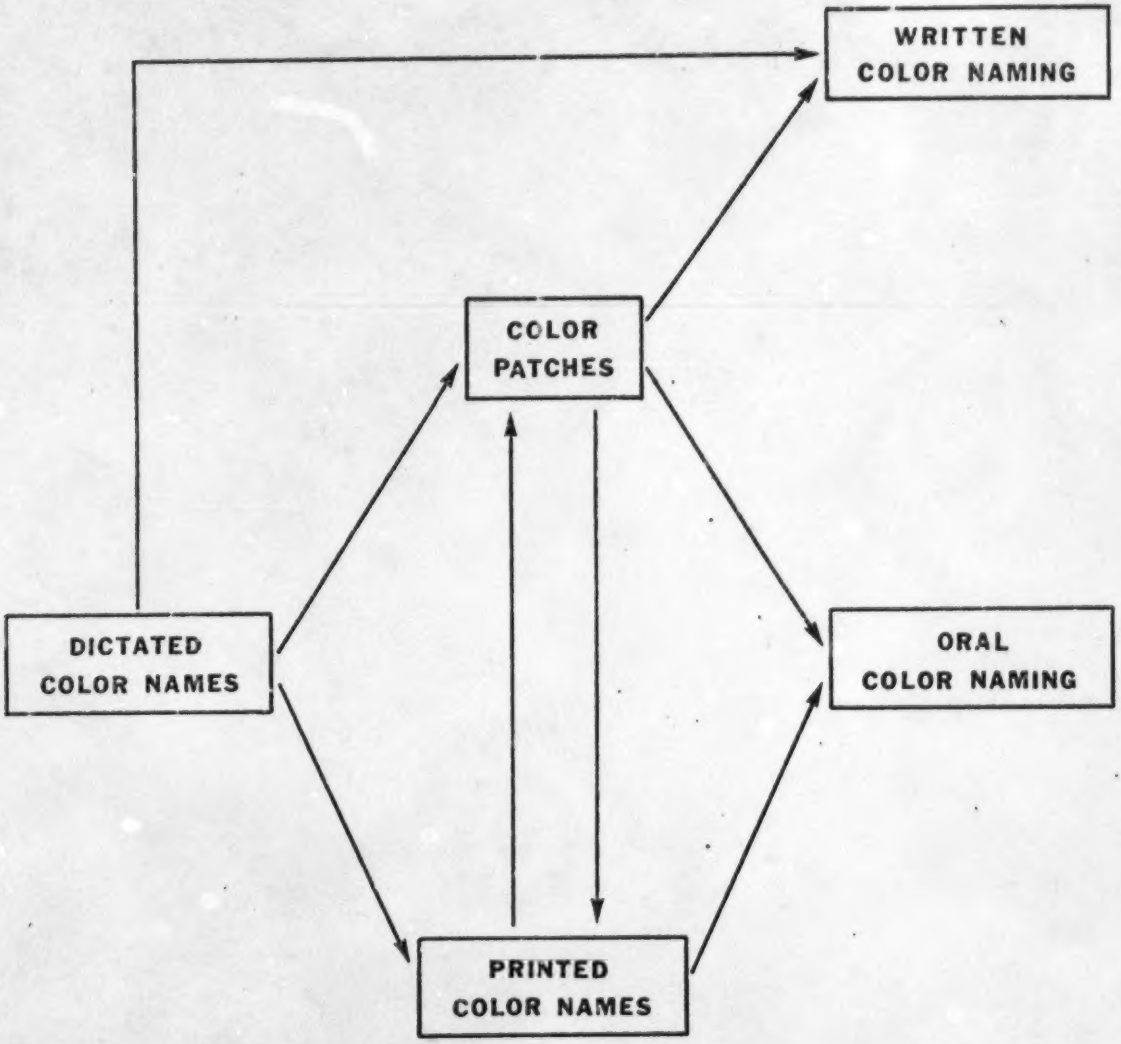
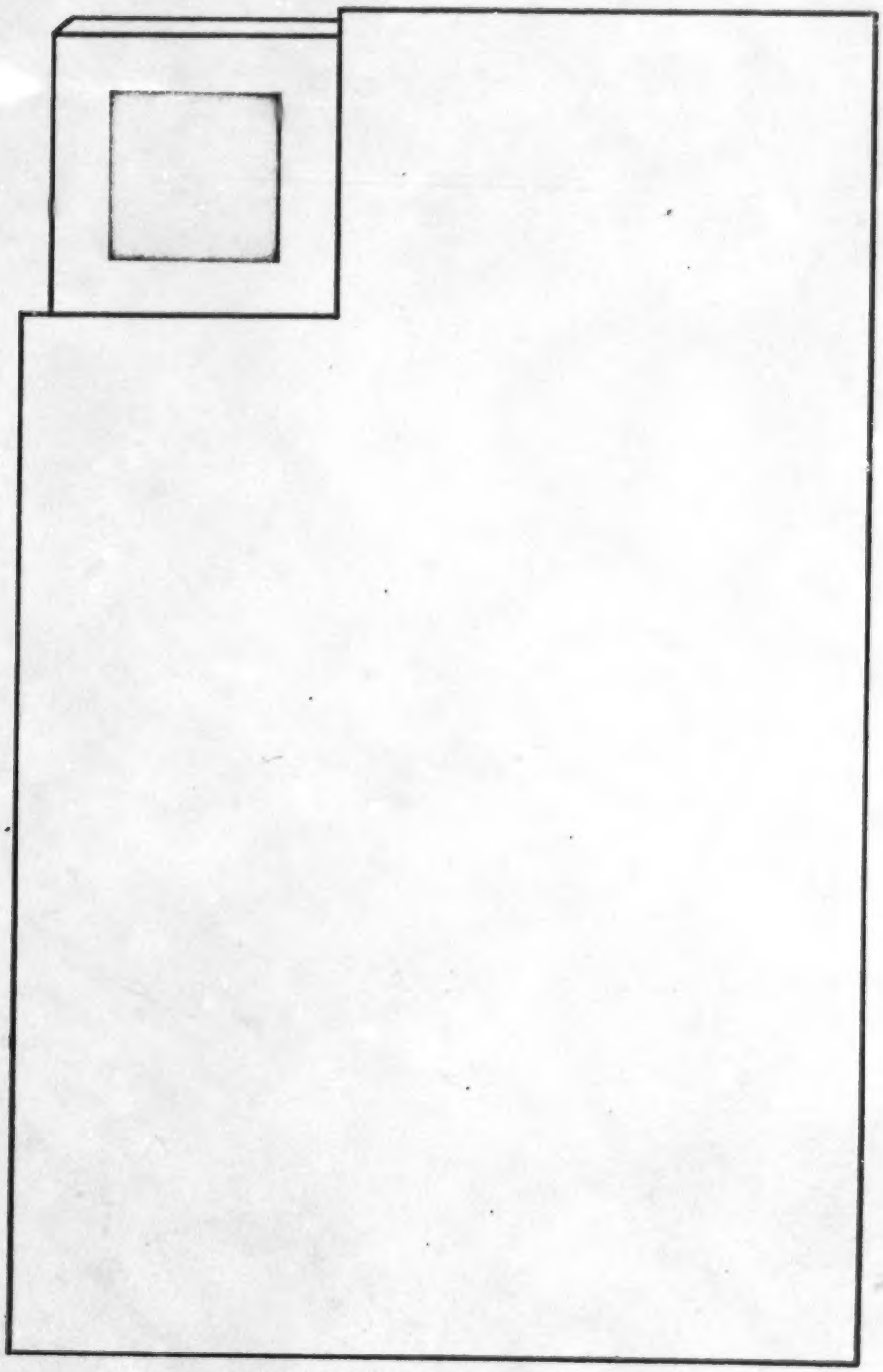


Slide 1



Slides 2, 12, 14



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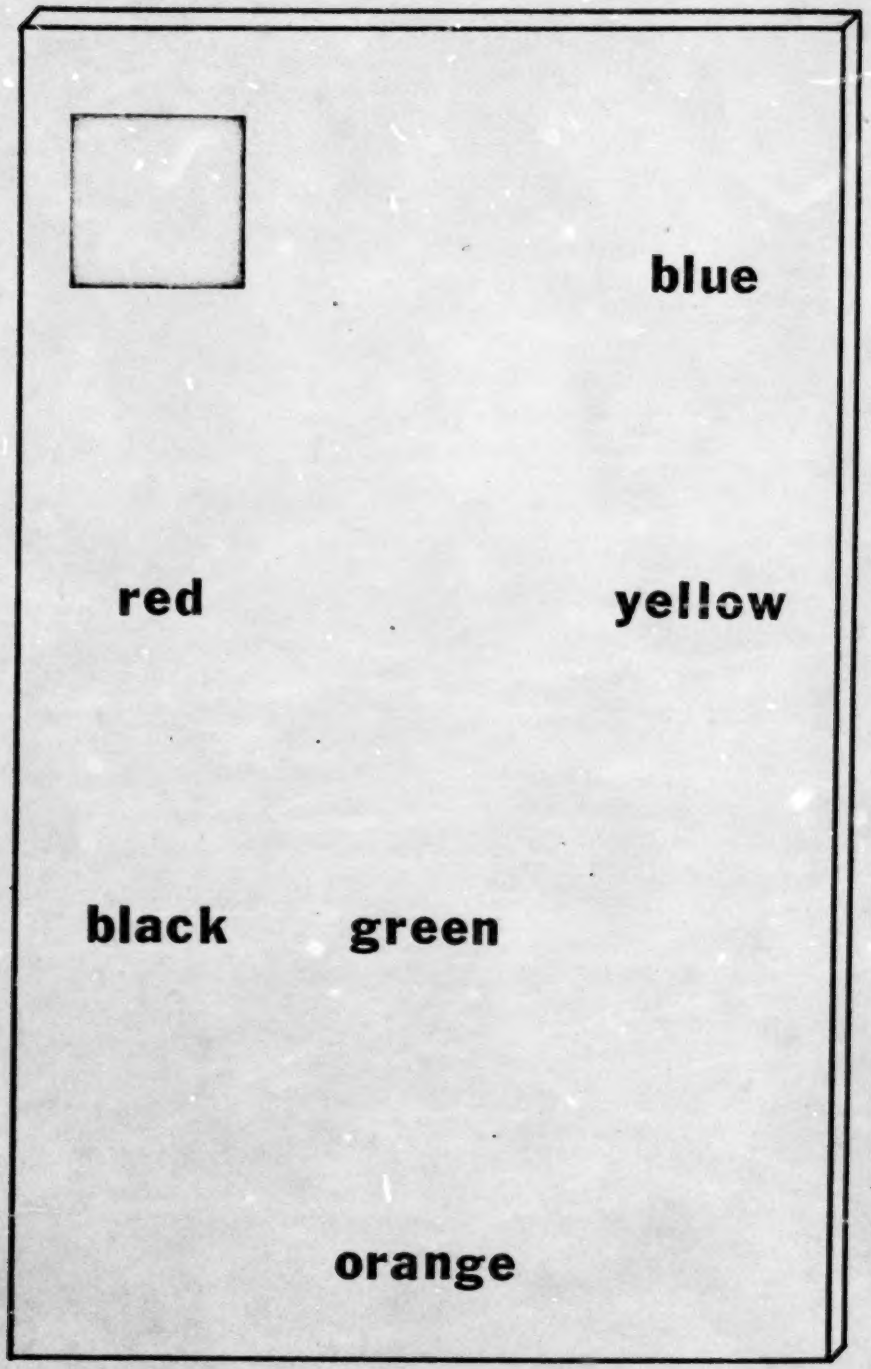

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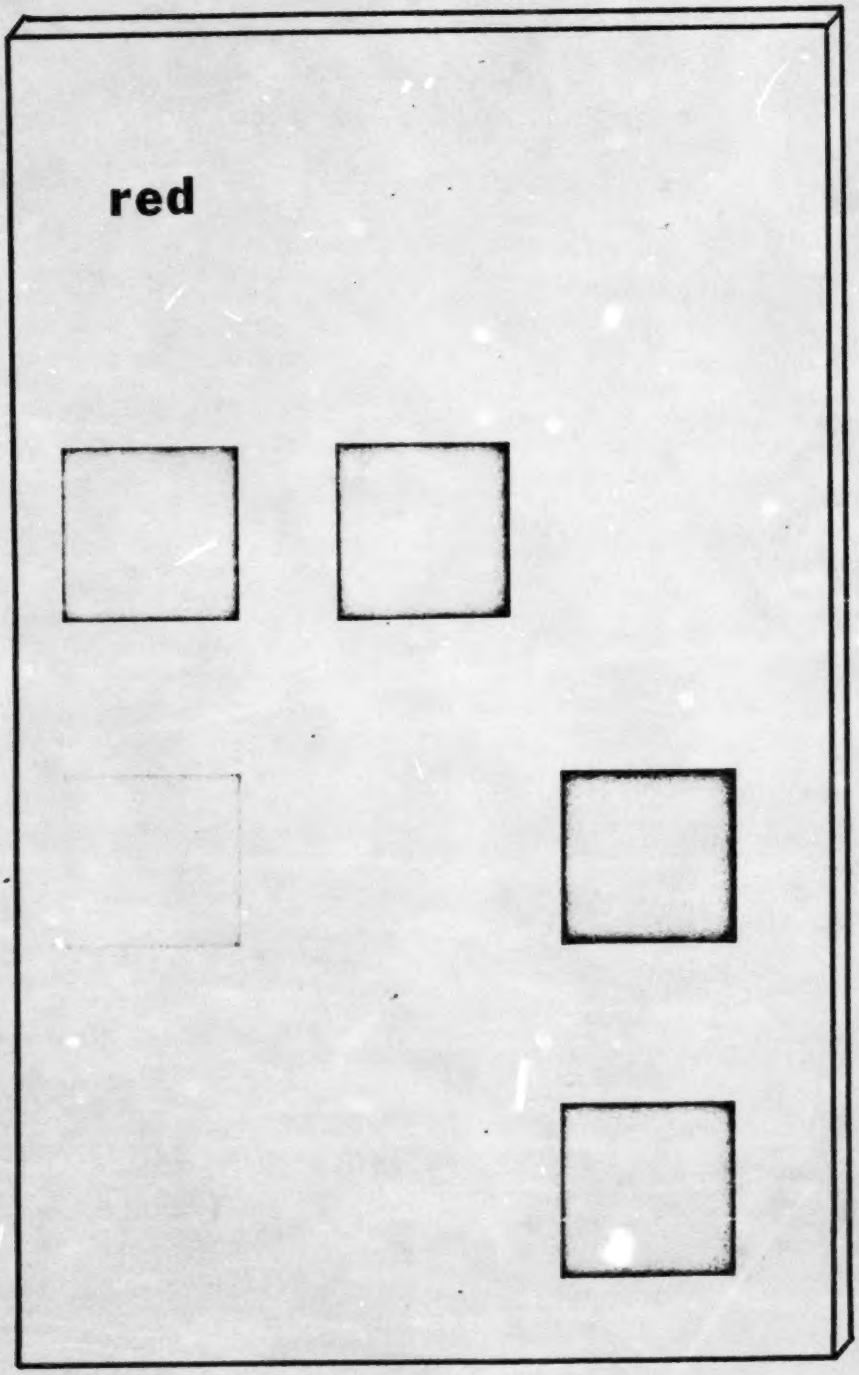

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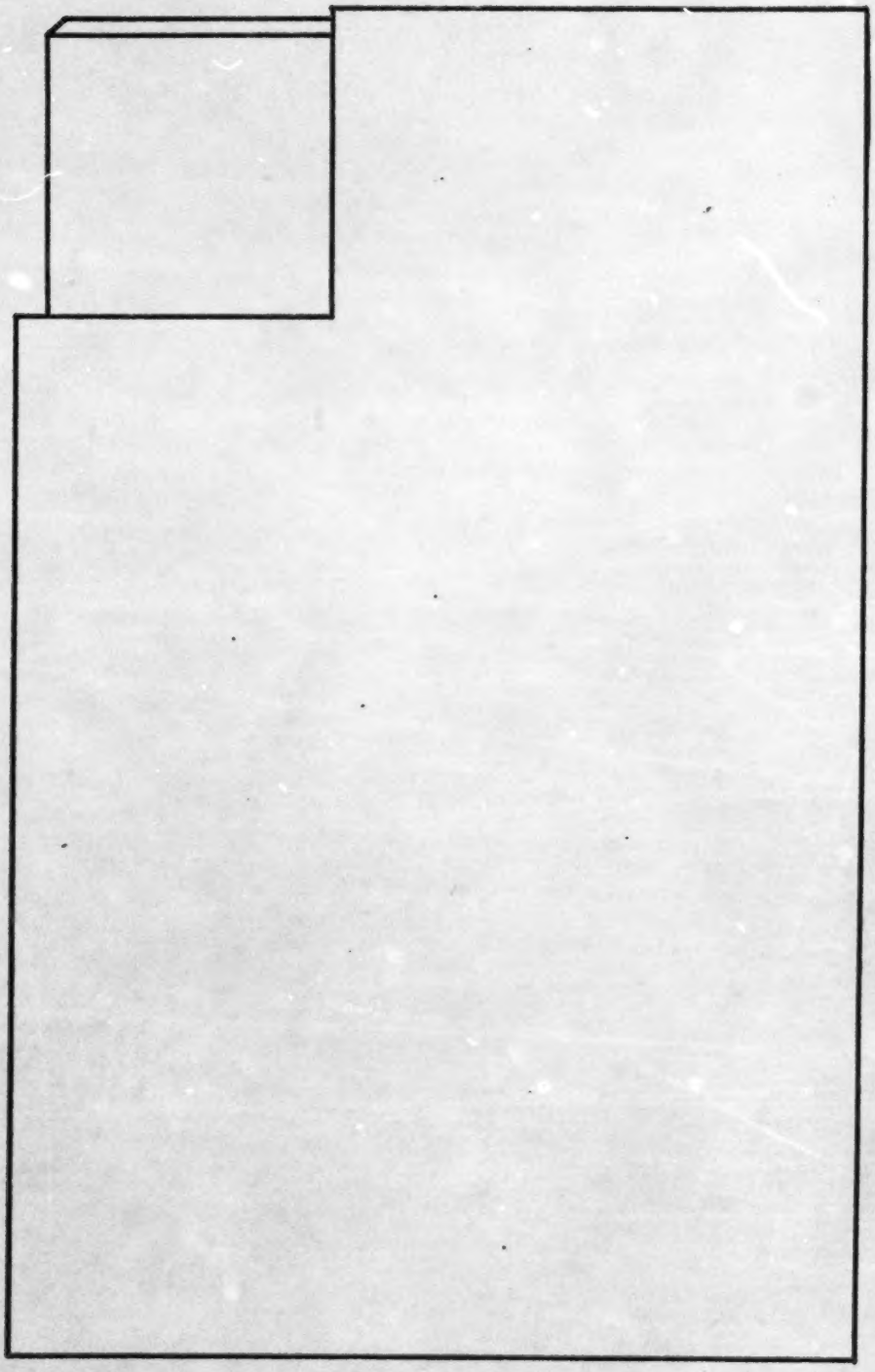

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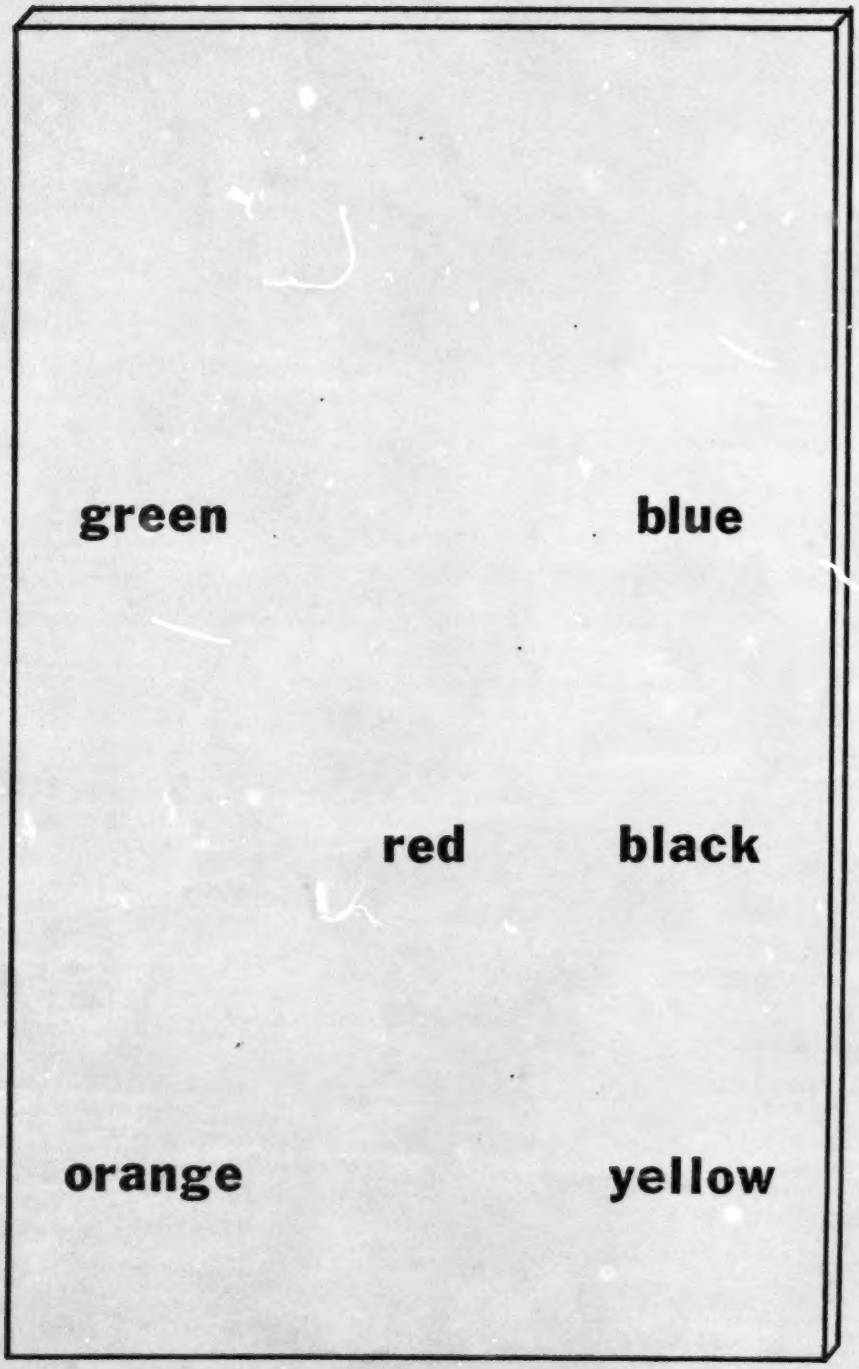

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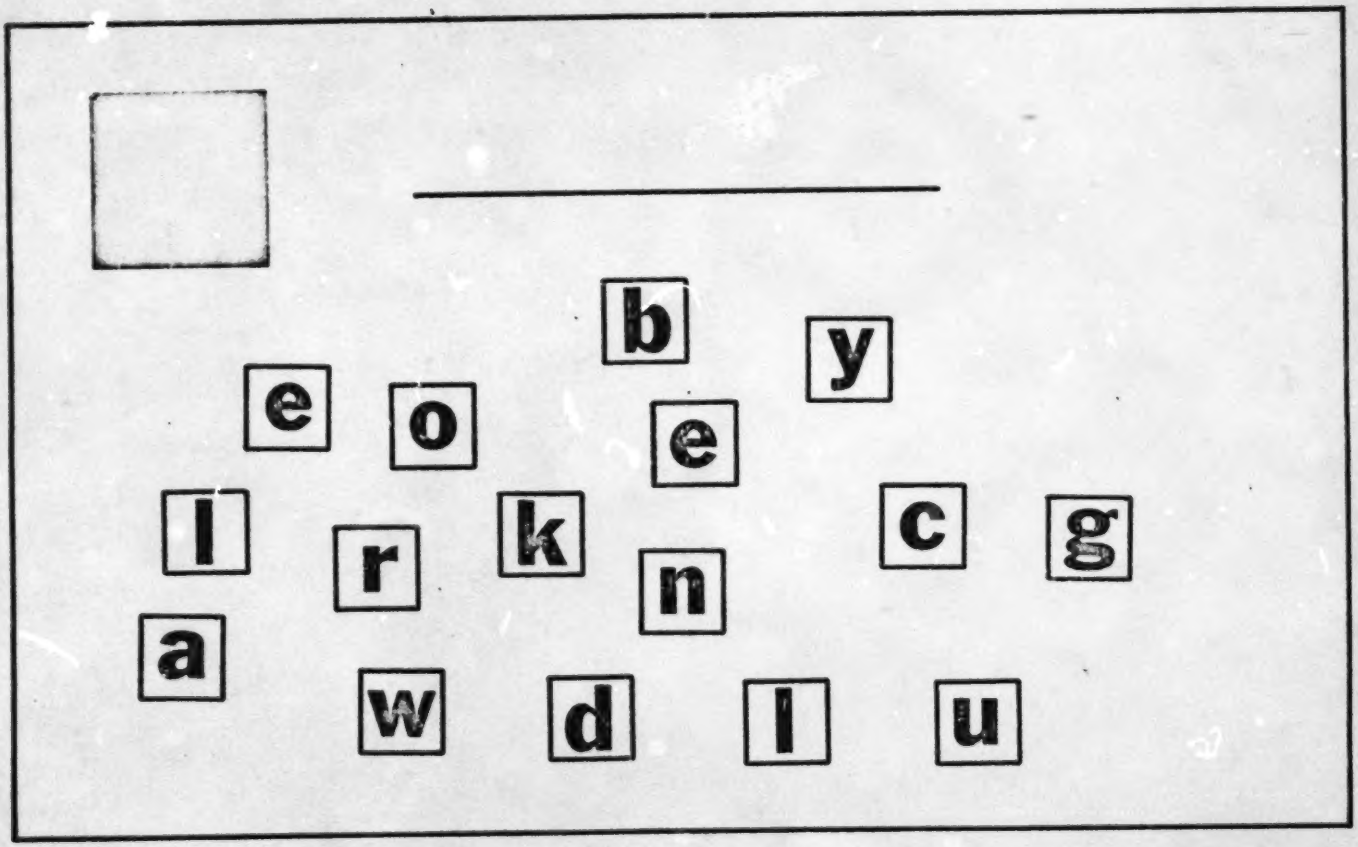

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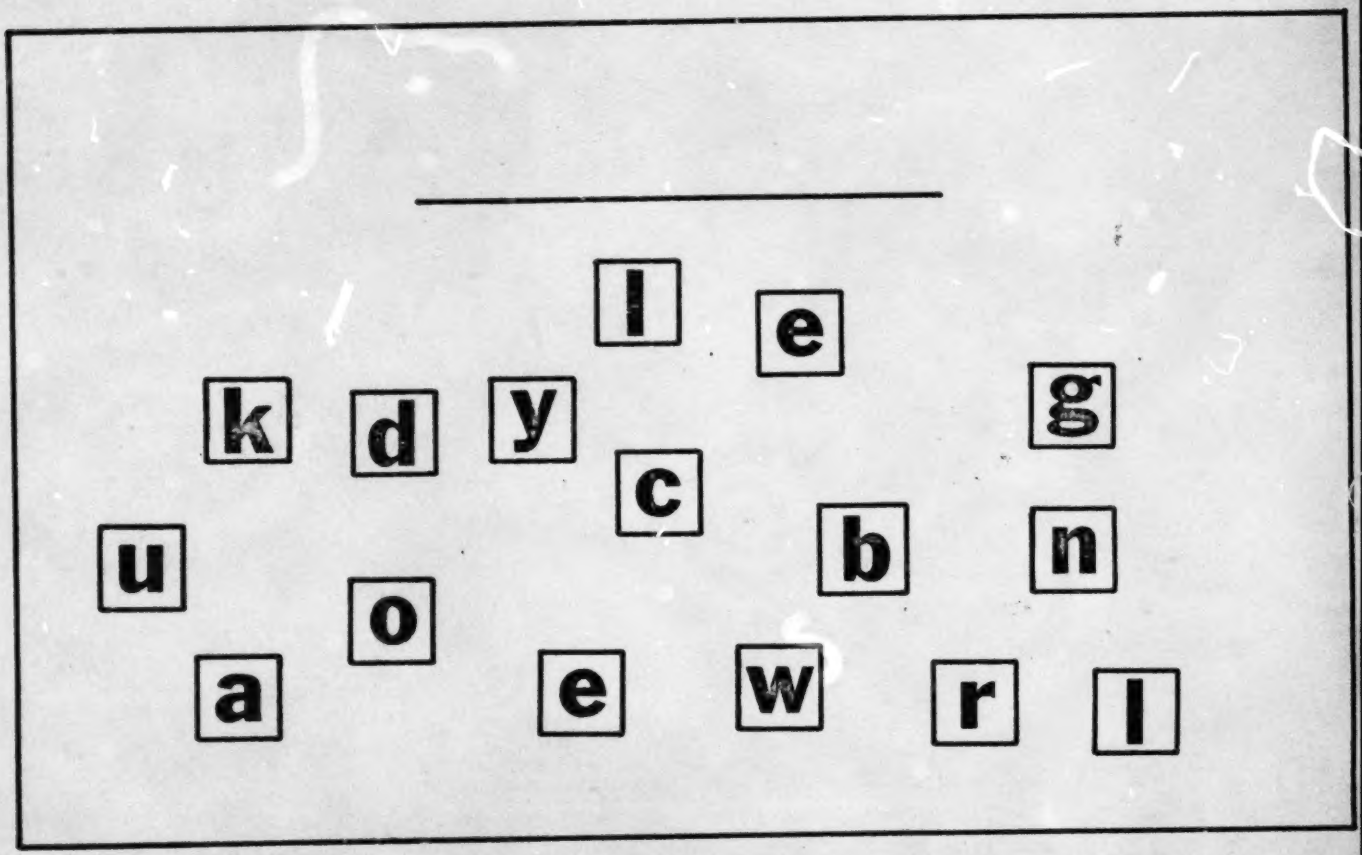

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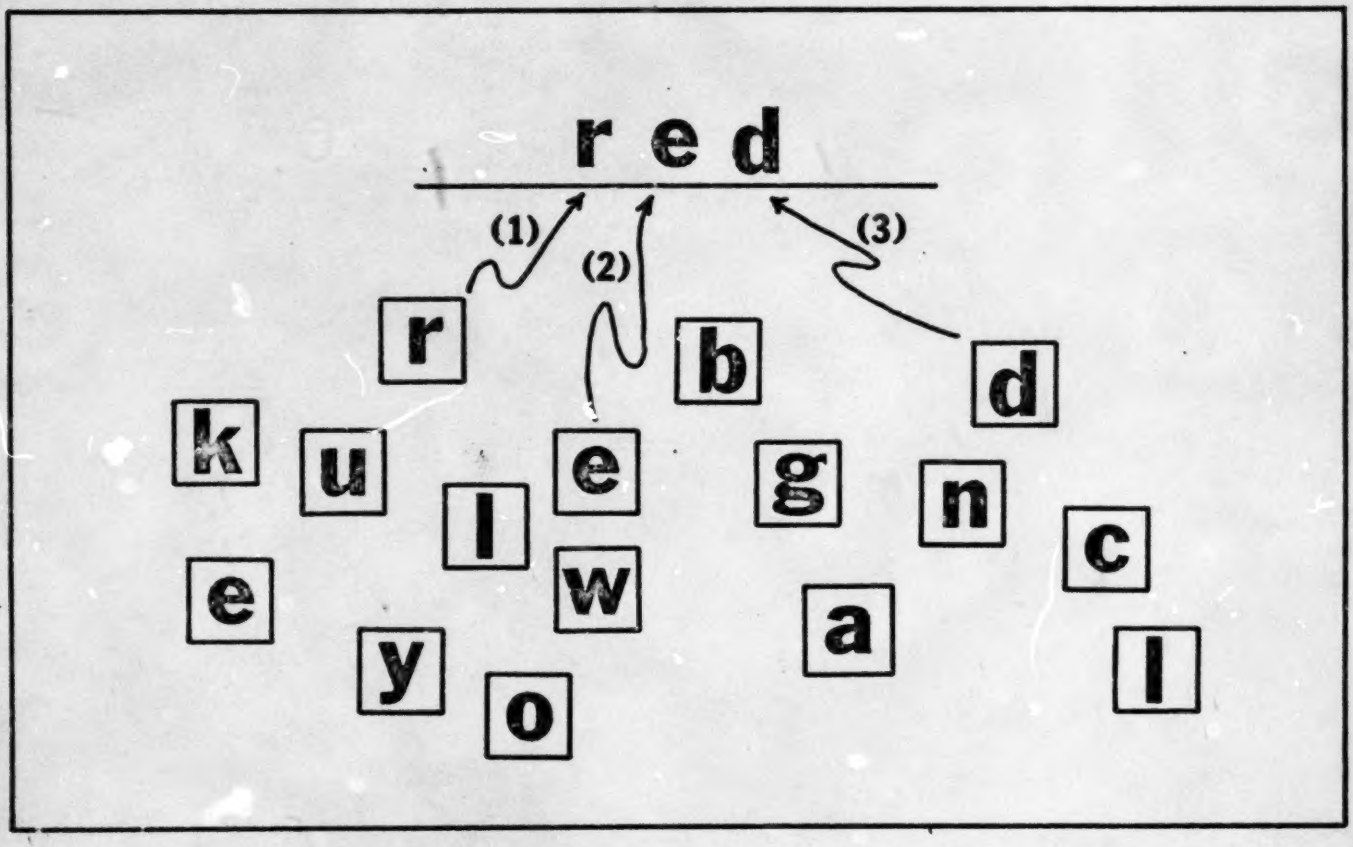

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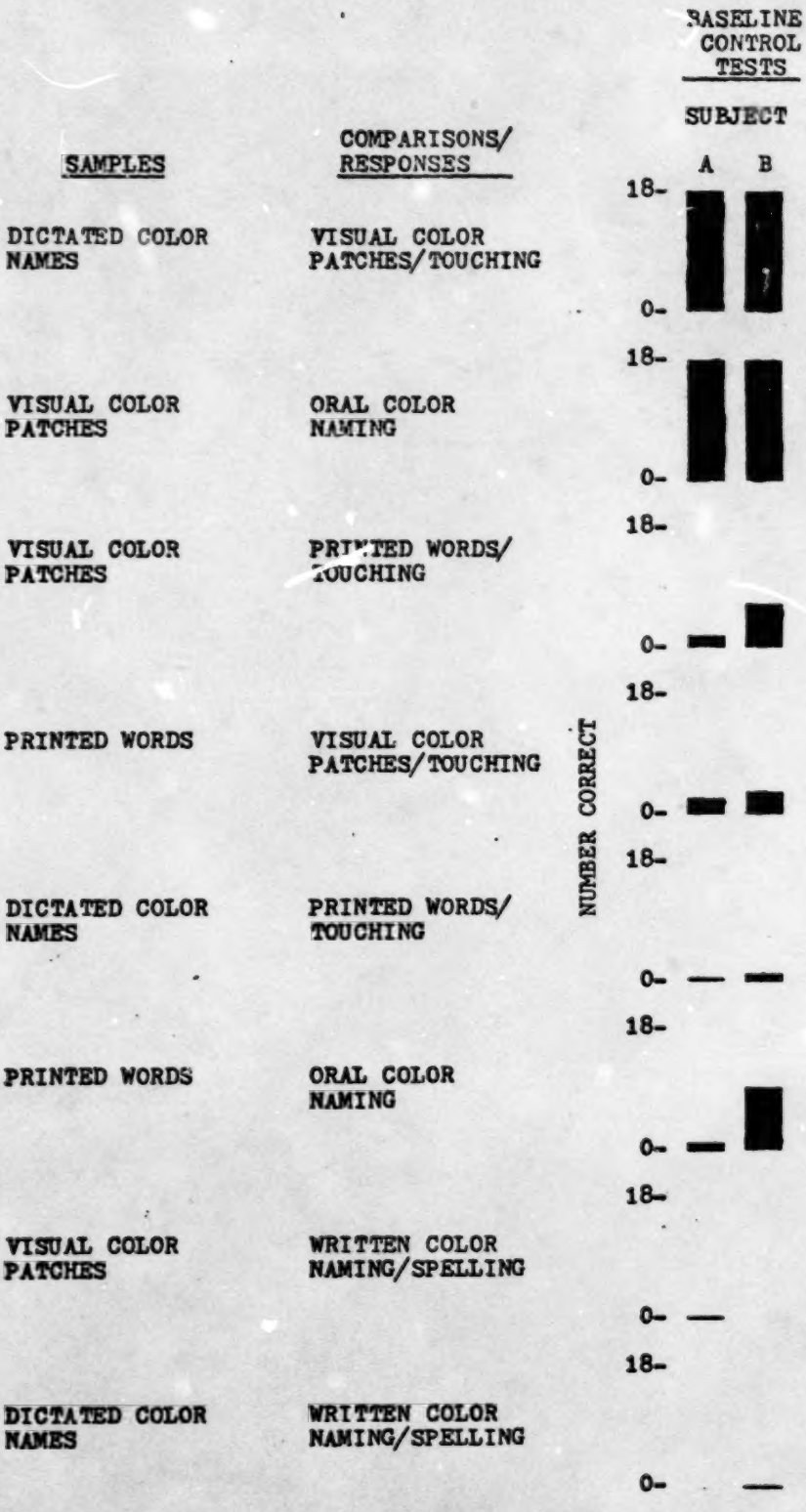
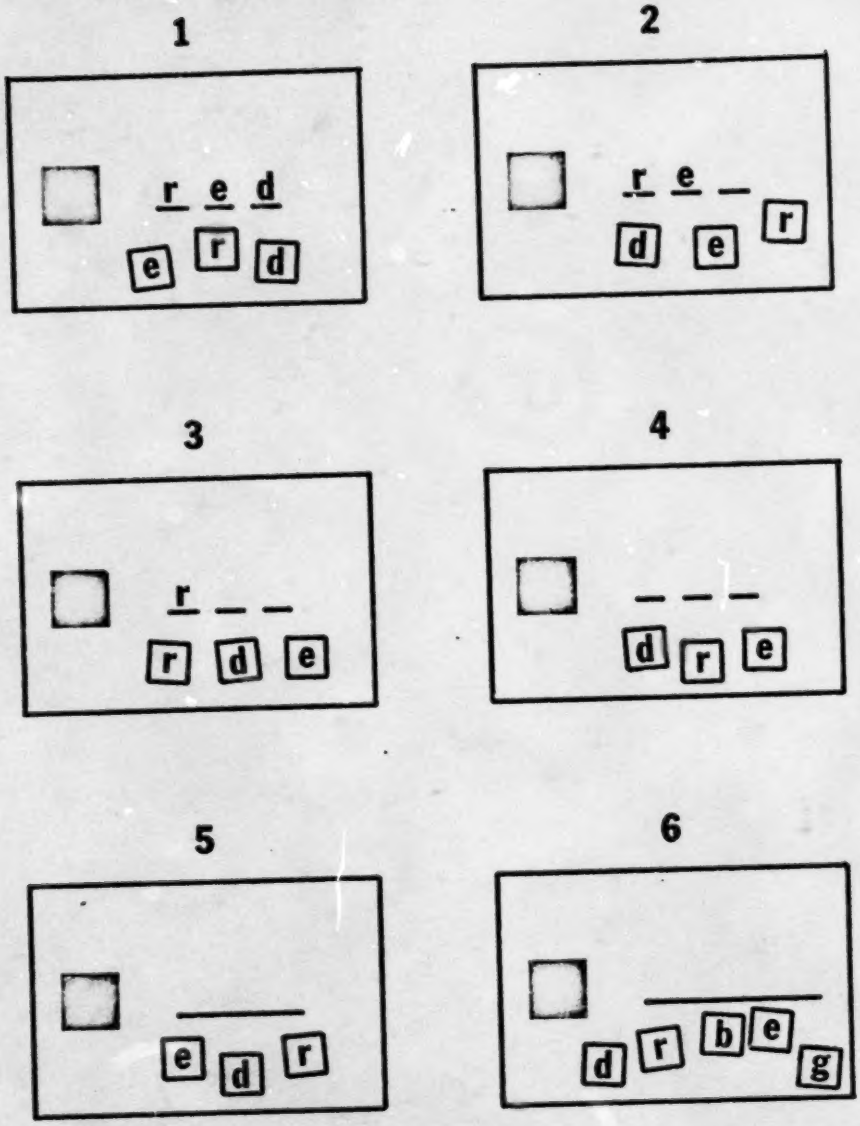

BASELINE CONTROL TESTS
SUBJECT
A
B
SAMPLES
COMPARISONS/ RESPONSES
DICTATED COLOR NAMES
VISUAL COLOR PATCHES/TOUCHING
VISUAL COLOR PATCHES
ORAL COLOR NAMING
VISUAL COLOR PATCHES
PRINTED WORDS/ TOUCHING
PRINTED WORDS
VISUAL COLOR PATCHES/TOUCHING
DICTATED COLOR NAMES
PRINTED WORDS/ TOUCHING
PRINTED WORDS
ORAL COLOR NAMING
VISUAL COLOR PATCHES
WRITTEN COLOR NAMING/SPELLING
DICTATED COLOR NAMES
WRITTEN COLOR NAMING/SPELLING
NUMBER CORRECT
18-
0-

Slide 11



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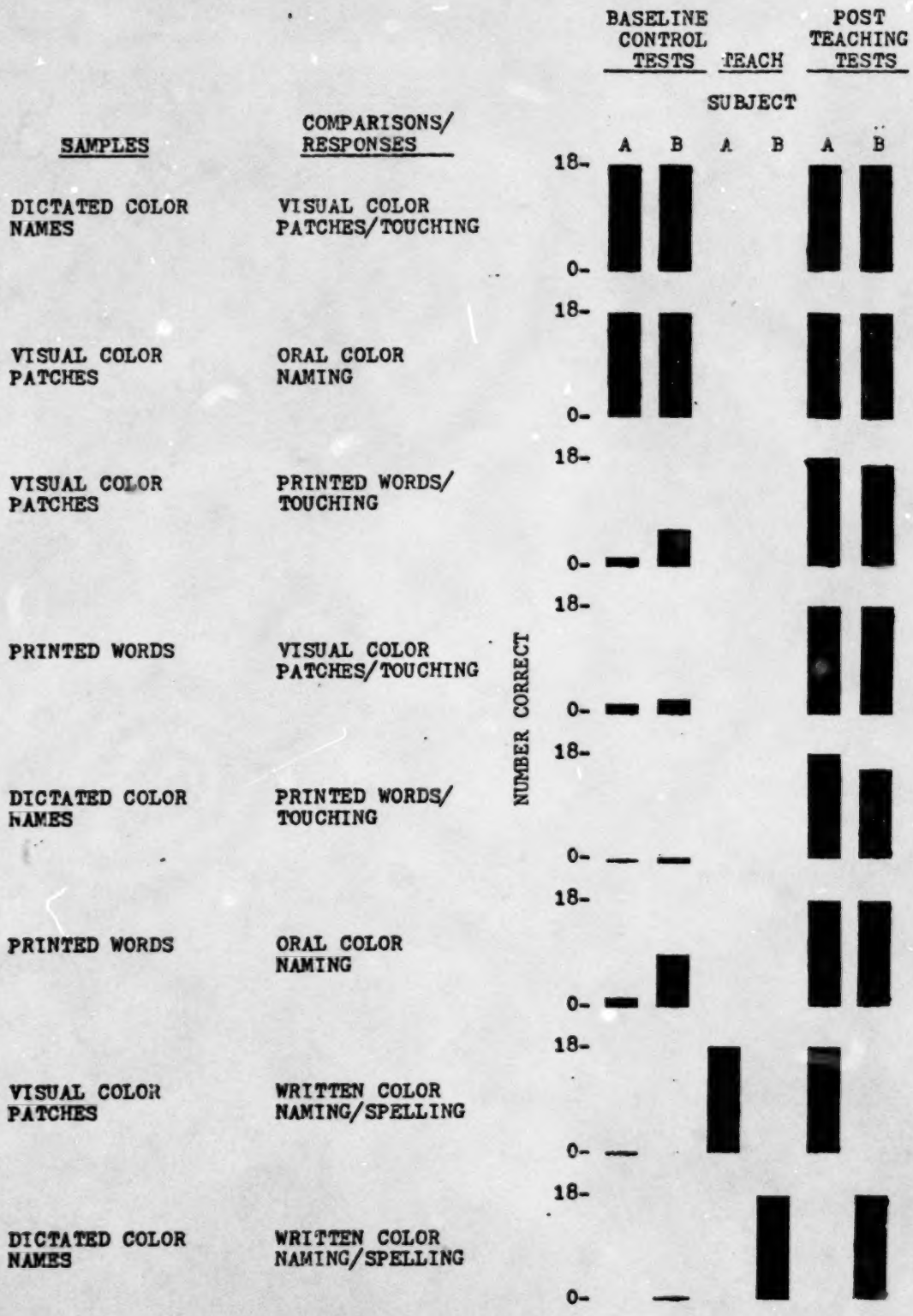
BASELINE CONTROL TESTS
TEACH
POST TEACHING TESTS
SUBJECT
A
B
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SAMPLES
COMPARISONS/ RESPONSES
DICTATED COLOR NAMES
VISUAL COLOR PATCHES/TOUCHING
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VISUAL COLOR PATCHES
WRITTEN COLOR NAMING/SPELLING
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WRITTEN COLOR NAMING/SPELLING
NUMBER CORRECT
18-
0-

Slide 15